

**CLASS 719, ELECTRICAL COMPUTERS AND DIGITAL PROCESSING SYSTEMS: INTER-PROGRAM COMMUNICATION OR INTER-PROCESS COMMUNICATION (IPC)**

**SECTION I - CLASS DEFINITION**

**GENERAL STATEMENT OF THE CLASS SUBJECT MATTER**

This class provides for an electrical computer or digital data processing system or corresponding data processing method including apparatus or steps for exchanging data or messages between two executing programs or processes, independent of the hardware used in the communication.

- (1) Note. Classification herein requires more than nominal recitation of the data or message exchange between two executing programs or processes.
- (2) Note. If the programs or processes are drawn to specific processing environments such as database/file processing, business processing, or networking, these programs or processes are classified elsewhere.

**SCOPE OF THE CLASS**

This class is limited to digital data processing systems and functions for communication between programs or processes.

Hardware mechanisms such as bus transaction processing and data transfer between computers and digital data processing systems are classified elsewhere. See the SEE OR SEARCH CLASS notes below.

**LINES WITH OTHER CLASSES**

**A. Electrical Computers and Data Processing Systems, Related Systems and Functions in General**

This class is for communication between programs or processes. Communication between computers or digital data processing systems and peripherals is classified elsewhere. See the SEE OR SEARCH CLASS notes below.

**B. Communication Classes**

The basic distinctions between this class and the communications classes are:

(A) The subclasses here include a digital data processing system or computer, rather than other data communications devices, and

(B) The communication herein is between programs or processes in a digital data processing system or computer. See the SEE OR SEARCH CLASS notes below.

Overall combinations directed to a system for performing communications functions only is classified in the appropriate communication class. See the SEE OR SEARCH CLASS notes below for examples.

Preprocessing or postprocessing of signals in a data transfer to effect a particular communications method (e.g., modulating, demodulating, encoding, decoding, or phase locking) is classified in the appropriate communications class. See the SEE OR SEARCH CLASS notes below for examples.

**C. Other Classes**

Subject matter relating to transmission or interconnection systems not classifiable herein and not appropriate for the communication classes should be classified in the residual class for all transmission or interconnection systems. See the SEE OR SEARCH CLASS notes below.

**SECTION II - REFERENCES TO OTHER CLASSES**

**SEE OR SEARCH CLASS:**

- 235, Registers, appropriate subclasses for basic machines and associated indicating mechanisms for ascertaining the number of movements of various devices and machines, plus machines made from these basic machines alone (e.g., cash registers, voting machines), and in combination with various perfecting features, such as printers and recording means, and for various data bearing record controlled systems.
- 307, Electrical Transmission or Interconnection Systems, appropriate subclasses for a residual transmission or interconnection system not classifiable elsewhere, including interconnection systems, per se.
- 326, Electronic Digital Logic Circuitry, appropriate subclasses for generic digital logic devices, circuitry, and subcombinations thereof, wherein operations other than arithmetical are per-

- formed upon discrete electrical signals representing a value normally described by numerical digits.
- 329, Demodulators, appropriate subclasses for data demodulators.
- 332, Modulators, appropriate subclasses for data modulators.
- 340, Communications: Electrical, subclasses 825 through 825.98 for controlling one or more devices to obtain a plurality of results by transmission of a designated one of plural distinctive control signals over a smaller number of communication lines or channels, particularly subclasses 2.1-2.8 for path selection, subclasses 3.1-3.9 for communication systems where status of a controlled device is communicated, subclass 825.02 for tree or cascade selective communication, subclasses 825.2-825.21 for synchronizing selective communication systems, subclasses 825.5-825.51 for lockout or priority in selective communication systems, subclasses 825.52 and 825.53 for addressing, and subclasses 825.57-825.69 for pulse responsive actuation in selective communication.
- 341, Coded Data Generation or Conversion, subclasses 50 through 172 for electrical pulse and digit code converters (e.g., systems for originating or emitting a coded set of discrete signals or translating one code into another code wherein the meaning of the data remains the same but the formats may differ).
- 342, Communications: Directive Radio Wave Systems and Devices, appropriate subclasses for systems and processes for transmission or reception of radio wave energy for obtaining or utilizing information (using radio wave transmitters or receivers), as to an object, or as to the directional characteristics of the radio wave energy, per se.
- 345, Computer Graphics Processing, Operator Interface Processing, and Selective Visual Display Systems, subclasses 530 through 574 for visual display, subclasses 30 through 111 for the selective control of two or more light generating or light controlling display elements in accordance with a received image signal, and subclasses 804-805 for interwindow links and communication.
- 358, Facsimile and Static Presentation Processing, various subclasses for the recordation, reproduction and transmission of images of arbitrary composition.
- 360, Dynamic Magnetic Information Storage or Retrieval, appropriate subclasses for record carriers and systems wherein information is stored and retrieved by interaction with a magnetic medium and there is relative motion between said magnetic medium and a transducer, for example, a magnetic disk drive device, and control thereof, per se.
- 365, Static Information Storage and Retrieval, appropriate subclasses for addressable static singular storage elements or plural singular storage elements of the same type (i.e., the internal elements of memory, per se).
- 369, Dynamic Information Storage or Retrieval, appropriate subclasses for record carriers and systems wherein information is stored and retrieved by interaction with a medium and there is relative motion between a medium and a transducer.
- 370, Multiplex Communications, appropriate subclasses for the simultaneous transmission of two or more signals over a common medium, particularly subclasses 351 through 430 for multiplex switching.
- 375, Pulse or Digital Communications, appropriate subclasses for generic pulse or digital communication systems and synchronization of clocking signals from input data.
- 377, Electrical Pulse Counters, Pulse Dividers, and Shift Registers: Circuits and Systems, appropriate subclasses for generic electric circuits for pulse counting.
- 379, Telephonic Communications, appropriate subclasses for two-way electrical communication of intelligible audio information of arbitrary content over a communication link.
- 380, Cryptography, appropriate subclasses for cryptographic apparatus or process in general which includes electric signal modification.
- 381, Electrical Audio Signal Processing Systems and Devices, appropriate subclasses for wired one-way audio systems, per se.
- 382, Image Analysis, appropriate subclasses for operations performed on image data with the aim of measuring a characteristic of an image, detecting variations, detecting structures, or transforming the image data, and for procedures for analyzing and categorizing patterns present in image data.
- 388, Electricity: Motor Control Systems, cross-reference art collection 907.5 for computer or processor control of DC motor acceleration or speed.

- 455, Telecommunications, appropriate subclasses for modulated carrier wave communication, per se, and subclass 26.1 for subject matter which blocks access to a signal source or otherwise limits usage of modulated carrier equipment.
- 700, Data Processing: Generic Controls Systems or Specific Applications, subclasses 1 through 89 for generic data processing control system, apparatus, or process, particularly subclasses 2 through 7 for plural processors in a digital control system application, and subclasses 90 through 306 for applications of computers in various environments where there is significant claim recitation of the data computer system or calculating computer and only nominal recitation of an external art environment (where significant structure of an external device is claimed, classification is in the appropriate device class).
- 701, Data Processing: Vehicles and Navigation, appropriate subclasses for applications of computers in vehicular and navigational environments.
- 702, Data Processing: Measuring and Testing, appropriate subclasses for applications of computers in measuring and testing.
- 704, Data Processing: Speech Signal Processing, Linguistics, Language Translation, and Audio Compression/Decompression, subclasses 1 through 10 for applications of computers in linguistics, subclasses 200 - 278 for applications of computers in speech signal processing, and subclasses 500 - 504 for applications of computers in audio compression/decompression.
- 705, Data Processing: Financial, Business Practice, Management, or Cost/Price Determination, appropriate subclasses for applications of computers and calculators in business and management environments.
- 706, Data Processing: Artificial Intelligence, appropriate subclasses for subject matter directed to artificial intelligence data computer which is disclosed or claimed in plural diverse arts both in combination and in the alternative (e.g., digital data computer system for use in image analysis or electrical audio signal computer, and for artificial intelligence per se).
- 707, Data Processing: Databases and File Management, Data Structures, and Document Processing, subclasses 1 through 206 for database processing.
- 708, Data Processing: Arithmetic Processing and Calculating, subclasses 1 through 9 for hybrid computers; subclasses 100 - 714 for calculators, digital signal computer, and arithmetical and logical computer, per se; and subclasses 800 - 854 for electric analog computers.
- 709, Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring or Plural Processor Synchronization, appropriate subclasses for transferring data or instruction information between a plurality of computers wherein the computers employ the data or instructions before or after transferring and the employing affects said transfer of data or instruction information and for the synchronization of plural processors even if the transferring employs peripherals, e.g., modems, or line adaptors.
- 710, Electrical Computers and Digital Processing Systems: Input/Output, subclasses 1 through 74 for transferring data from one or more peripherals to one or more computers for the latter to process, store, or further transfer or for transferring data from the computers to the peripherals, and subclasses 100 - 132 for data transferring among memories, processors, and buses of a computer.
- 711, Electrical Computers and Digital Processing Systems: Memory, subclasses 100 through 173 for accessing or controlling memories that are peripherals.
- 712, Electrical Computers and Digital Processing Systems: Processing Architecture and Instruction Processing, subclasses 1 through 43 for digital data computer system architectures such as multiple instruction multiple data (MIMD) computers, vector and array computers, and single-chip computers.
- 713, Electrical Computers and Digital Processing Systems: Support, subclass 1 and 2 for digital processing system initialization and configuration (e.g., initializing, set-up, resetting), subclass 100 for reconfiguring digital data computer system (e.g., changing system settings), subclasses 150 through 181 for multiple computer communication protection by cryptography, subclass 187 for computer program modification detection by cryptography, subclass 188 for computer virus detection by cryptography, subclasses 200 - 202 for methods and apparatus serving to protect a digital data computer system from unauthorized use (e.g., virus detecting, user identifying, etc.), subclasses 300 - 340 for computer power control,

- subclasses 400 and 401 for synchronization of computer clocks, data timing signals, or pulses, and subclasses 500 - 503 for computer clock, pulse, or timing signal or analysis.
- 714, Error Detection/Correction and Fault Detection/Recovery, subclasses 1 through 57 for methods and apparatus for increasing the probability of a system performing correctly, and subclasses 746-797 for correcting errors in the transmitted data such as parity checking and cyclical redundancy checking.
- 715, Data Processing: Presentation Processing of Document, appropriate subclasses for document processing.
- 718, Electrical Computers and Digital Processing Systems: Virtual Machine Task or Process Management or Task Management/Control, appropriate subclasses for administering over processor or job execution in a digital data processing system
- Address data: data that represent or identify a source or destination.
- Instruction data: data that represent an operation and identify its operands, if any.
- Status data: data that represent conditions of data, digital data processing systems, computers, peripherals, memory, etc.
- Streamed data: data consisting of a more-or-less continuous series of bits, bytes, or other small, structurally uniform units.
- User data: data other than address data, instruction data, or status data.

## DATA PROCESSING

See PROCESSING, below.

## SECTION III - GLOSSARY

### ACCESS

To obtain entry to, or to locate, read into memory, and make ready for, some operation, for example, regarding disks, files, records, and network entry procedures.

### APPLICATION PROGRAM

A computer program designed to perform a certain type of work, such as an application to manipulate text, numbers, graphics, or a combination of these elements. An application differs from an operating system (which runs a computer), a utility (which performs maintenance or general-purpose chores), and a language (with which computer programs are created).

### BUS

A conductor used for transferring data, signals, or power.

### COMPUTER

A machine that inputs data, processes data, stores data, and outputs data.

### DATA

A representation of information in a coded manner suitable for communication, interpretation, or processing.

### DIGITAL DATA PROCESSING SYSTEM

An arrangement of processor(s) in combination with either memory or peripherals, or both, performing data processing.

### ENTITY

A computer or process that can be treated as a unit and, often, as a member of a particular category or type.

### ENVIRONMENT

A set of resources made available to the user of a system which defines specifications such as the command path (where to look for files), the system prompt and, sometimes, the location of resources or working files.

### INFORMATION

Meaning that a human being assigns to data by means of the conventions applied to that data.

### INTERFACE

A connection between two elements so that they can work with one another.

### MEMORY

A functional unit to which data can be stored and from which data can be retrieved.

**MULTITASKING**

A mode of operation in which a computer works on more than one task at a time.

**NETWORK**

A group of computers and associated devices that are connected by communications facilities which exists to provide computer users with the means of communicating and transferring information electronically. Some types of communication are simple user-to-user messages; others, of the type known as distributed processes, can involve several computers and the sharing of workloads or cooperative efforts in performing a task.

**OBJECT**

A variable comprising routines and data that is treated as a discrete entity.

**OPERATING SYSTEM**

Software responsible for controlling the allocation and usage of hardware resources such as memory, central processing unit (CPU) time, disk space, and peripheral devices. The operating system is the foundation on which applications programs (e.g., word processing, spreadsheets) are built.

**PERIPHERAL**

A functional unit that transmits data to or receives data from a computer to which it is coupled.

**PROCESS**

A coherent sequence of steps undertaken by a program to manipulate data such as an internal or external data-transfer operation, handling an interrupt, or evaluation of a function.

**PROCESSING**

Methods or apparatus performing systematic operations upon data or information exemplified by functions such as data or information transferring, merging, sorting, and computing (e.g., arithmetic operations or logical operations).

- (1) Note. In this class, the glossary term data is used to modify processing in the term data processing; whereas the term digital data

processing system refers to a machine performing data processing.

- (2) Note. In an effort to avoid redundant constructions, in this class, where appropriate, the term address data processing is used in place of address data data processing.

**PROCESSOR**

A functional unit that interprets and executes instruction data.

**PROTOCOL**

A set of rules or processes which enable computers to exchange information with as little error as possible.

**RESOURCE**

Any part of computer system or a network, such as a disk drive, printer, or memory, that can be allotted to a program or process while it is running. In programming, a resource can be used by more than one program or in more than one place in a program. For example, dialog boxes, bitmaps, and fonts are resources in many windowing programs.

**ROUTING**

Receiving transmitted messages within a network and forwarding them to their correct destinations over a available route selected according to a predetermined criteria.

**SERVER**

A computer running administrative software that controls access to all or part of a network and its resources (such as disk drives and printers). A computer acting as a server makes resources available to computers acting as workstations on the network.

**SYNCHRONIZATION**

Matching of timing between separate computers or among the components of a system so that all are coordinated.

**TASK**

A standalone application or a subprogram that is run as an independent entity.

**THREAD**

A path of processing execution within a larger process or program.

**TRANSFER**

The movement of data from one location to another or the passing of program control from one portion of a program to another.

**SUBCLASSES****310 MISCELLANEOUS:**

This subclass is indented under the class definition. Subject matter not provided for in any of the above subclasses of this class.

**311 COMMON GATEWAY INTERFACE PROGRAM COMMUNICATION:**

This subclass is indented under the class definition. Subject matter wherein a server program, or script is executed at the request of a client program through a web browser.

- (1) Note. User input information is passed to the programs/scripts using the Common Gateway Interface (CGI) convention and the server side CGI program sends the result back to the client using dynamic html.

**312 INTERPROGRAM COMMUNICATION USING SHARED MEMORY:**

This subclass is indented under the class definition. Subject matter comprising means or steps for communication between plural processes or application programs using a memory which can be shared between those processes or programs.

**313 INTERPROGRAM COMMUNICATION USING MESSAGE:**

This subclass is indented under the class definition. Subject matter comprising means or steps for communication between processes or application programs using pieces of information which suggest actions to be taken or indicate conditions or indicate that an event has occurred.

- (1) Note. Sending a message to an object is equivalent to calling a procedure in tra-

ditional programming languages, except that the actual code executed is selected at run-time depending on the class of the object. For example, in response to a message to draw an object, the code invoked would be different if the object were a circle or a square.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 312, for sending a message between processes via a shared memory.
- 314, for sending a message between processes using a queue.

**314 Message using queue:**

This subclass is indented under subclass 313. Subject matter comprising means or steps for communication between processes or application programs using messages that are lined up in a particular order.

- (1) Note. Examples of queues are FIFOs, named pipes, streams, and the like.

**315 Object oriented message:**

This subclass is indented under subclass 313. Subject matter comprising means or steps for communication between objects (e.g., a message tells a receiving object what to do) wherein a method or member function of a receiving object is invoked or called by a sending method of a sending object and the message passing may involve passing actual parameters (e.g., either by reference or by value) to the target object.

- (1) Note. Object-oriented data structure principles employed in message passing are properly classified here. Mere recitations to object oriented data structures, per se, do not automatically cause classification in this subclass. Object-oriented data structures, per se, are classified elsewhere, see the SEE OR SEARCH CLASS notes below.
- (2) Note. Messaging techniques abound in the data communications arts in the form of signaling protocols, message protocols, semaphore techniques, token passing, etc. An object oriented paradigm will present generalized functionality in a neatly reusable or customizable pro-

gram code “module”, therefore, a concept search for a messaging technique should also consider the other communications classes as appropriate.

**SEE OR SEARCH CLASS:**

- 307, Electrical Transmission or Interconnection Systems, appropriate subclasses for residual subject matter related to transmission or interconnection systems.
- 340, Communications: Electrical, subclasses 825 through 825.98 for controlling one or more devices to obtain a plurality of results by transmission of a designated one of plural distinctive control signals over a smaller number of communication lines or channels.
- 342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), various subclasses for systems and processes for transmission or reception of radio wave energy for obtaining or utilizing information (using radio wave transmitters or receivers), as to an object, or as to the directional characteristics of the radio wave energy, per se.
- 345, Computer Graphics Processing, Operator Interface Processing, and Selective Visual Display Systems, subclasses 804 through 805 for interwindow links and communication and subclasses 835-839 for items and metaphoric icon objects.
- 358, Facsimile and Static Presentation Processing, various subclasses for the recordation, reproduction and transmission of images of arbitrary composition.
- 370, Multiplex Communications, appropriate subclasses for the simultaneous transmission of two or more signals over a common medium.
- 375, Pulse or Digital Communications, various subclasses for digital communications processing including modulating, demodulating, encoding, decoding, and phase locking.
- 379, Telephonic Communications, various subclasses for two-way electrical communication of audio information of arbitrary content.

- 380, Cryptography, appropriate subclasses for concealing, obscuring and extracting intelligence by for example coding and decoding.
- 455, Telecommunications, appropriate subclasses for modulated carrier wave communications, per se.
- 707, Data Processing: Database and File Management or Data Structures, subclass 103 for an object oriented data structure, per se.
- 709, Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring or Plural Processor Synchronization, subclasses 200 through 253 for multicomputing, data transferring, per se, particularly subclasses 213-219 for transferring data via shared memory.
- 710, Electrical Computers and Digital Data Processing Systems: Input/Output, subclass 105 for bus protocols, per se.
- 712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclasses 220 through 248 for processing control including branch instruction processing.
- 714, Error Detection/Correction and Fault Detection/Recovery, subclasses 746 through 797 for correcting errors by transmittal data such as parity checking and cyclical redundancy checking.

**316 Managed object system:**

This subclass is indented under subclass 315. Subject matter comprising means or steps for managing an object system that may include distributed object systems or distributed object models.

**SEE OR SEARCH CLASS:**

- 707, Data Processing: Database and File Management or Data Structures, subclass 103 for an object oriented database.

**317 Agent:**

This subclass is indented under subclass 313. Subject matter comprising means or steps for using a software program that automatically performs some information gathering or processing task in the background on behalf of

another entity which would otherwise require some form of manual or directed intervention.

**318 EVENT HANDLING OR EVENT NOTIFICATION:**

This subclass is indented under the class definition. Subject matter comprising means or steps for communication of events between application programs or processes or within the context of application programs or processes.

- (1) Note. Event handling, event notification and system level exception processing are properly classified here.

**319 DATA TRANSFER BETWEEN OPERATING SYSTEMS:**

This subclass is indented under the class definition. Subject matter comprising means or steps for communication of data or messages between discrete operating systems.

- (1) Note. An operating system is a software platform on top of which application programs run.

**320 HIGH LEVEL APPLICATION CONTROL:**

This subclass is indented under the class definition. Subject matter comprising means or steps for communication of data, commands, or messages between at least one controlling script, macro or other high level controlling program, and at least one controlled application program.

- (1) Note. The high-level control program, macro, or script automatically controls the flow of input commands or data to the application program so as to provide automated high level control of at least one application program.

**321 DEVICE DRIVER COMMUNICATION:**

This subclass is indented under the class definition. Subject matter comprising means or steps for communication between application programs or operating systems and callable interfacing programs (i.e., device driver programs) which further facilitate communication or control of peripheral hardware devices such as printers, disk drives, tape drives, CRT displays, etc.

- (1) Note. Subject matter under this subclass is directed to high-level communication from an operating system or application program to a device driver program (i.e., program to program). Device drivers are software programs which are custom designed to handle the low-level implementation details required to directly access and control a particular peripheral device (i.e., program to hardware). See the appropriate peripheral device area for details of how the low-level control of the hardware device is implemented.

**SEE OR SEARCH CLASS:**

- 358, Facsimile and Static Presentation Processing, subclasses 1.1 through 1.18, various subclasses for the recordation, reproduction and transmission of images of arbitrary composition, particularly for a static presentation computer per se, and specifically subclasses 1.14 and 1.15 for reliability and data communication, per se.
- 709, Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring or Plural Processor Synchronization, subclasses 220 through 222 for configuring a network computer.
- 710, Electrical Computers and Digital Data Processing Systems: Input/Output, subclasses 1 through 74 for Input/Output data processing, per se, including subclass 8 for generalized peripheral configuration, per se, subclass 10 for address assignment and configuration initialization, subclass 11 for protocol selection, and subclass 20 for concurrent Input/Output computer and data transfer.
- 711, Electrical Computers and Digital Processing Systems: Memory, subclasses 100 through 173, for managing memory and for memory accessing and control.

**322 Multimedia device driver:**

This subclass is indented under subclass 321. Subject matter comprising means or steps for communication between application programs or operating systems and callable interfacing programs (i.e., device driver programs) which



further facilitate communication or control of peripheral multimedia hardware devices, such as CD-ROM and audio peripheral devices.

**323 Video graphics device driver:**

This subclass is indented under subclass 321. Subject matter comprising means or steps for communication between application programs or operating systems and callable interfacing programs (i.e., device driver programs) which further facilitate communication or control of peripheral video graphics hardware devices.

**324 Virtual device driver (VxD):**

This subclass is indented under subclass 321. Subject matter comprising software which virtualizes physical hardware by intercepting application requests to use the hardware and arbitrating between requests to access physical hardware from different applications.

- (1) Note. In the more extreme case, VxDs can provide a "virtual" device that is not actually present at all, by emulating the behavior of a hardware device. VxDs, by virtue of their privileged access to the system, can also be used to implement software monitors, debuggers, and to modify the behavior of other software on the system.

**325 RAID metadriver:**

This subclass is indented under subclass 321. Subject matter comprising means or steps for communication between an operating system and meta device drivers associated with a RAID (Redundant Array of Independent Disks) disk drive array.

**326 SCSI device driver:**

This subclass is indented under subclass 321. Subject matter comprising means or steps for communication between application programs or operating systems and callable interfacing programs (i.e., device driver programs) which further facilitate communication or control of SCSI (Small Computer System Interface) peripheral devices.

**327 Device driver configuration:**

This subclass is indented under subclass 321. Subject matter comprising means or steps for configuring or matching a peripheral hardware device with its appropriate corresponding soft-

ware device driver using lists, device description tables, device managers, device libraries, dynamic matching techniques, device binding techniques, and the like.

- (1) Note. Device driver configuration or matching may be performed dynamically at any time, but is typically performed subsequent to the physical installation of a new peripheral hardware device.
- (2) Note. Device driver matching may also be performed during the booting process, and whenever the computer system is configured or reconfigured.

**328 APPLICATION PROGRAM INTERFACE (API):**

This subclass is indented under the class definition. Subject matter comprising a set of routines, procedures, or interfaces which facilitate requests or calls from one or more application programs to lower-level operating system routines.

- (1) Note. This subclass is directed to the tools which allow application programs to utilize an operating system, application programs for specific information processing tasks, such as, simulation and design. Program development environments, business data processing, database systems, machine translation and document processing are classified elsewhere, see the SEE OR SEARCH CLASS notes below.
- (2) Note. This subclass is directed to the tools which allow application programs to utilize an operating system. Programming tools, per se, are classified elsewhere, SEE OR SEARCH CLASS notes below.
- (3) Note. Object oriented data structure principles may be employed in the development of an API and are properly classified here. Object oriented data structures, per se, are classified elsewhere. See the SEE OR SEARCH CLASS notes below.

- (4) Note. An application program interface (API) is a set of programming tools included with a software program or operating system that allows a programmer to write applications that work with that program or operating system. APIs save programmers much work by giving them easy ways to "hook into" the various capabilities of a program or operating system, instead of "reinventing the wheel" themselves.

SEE OR SEARCH CLASS:

- 345, Computer Graphics Processing, Interface Processing, and Selective Display Systems, subclasses 733 through 749 for operator interface aspects of workgroup for plural users or sites; subclasses 764-862 for on-screen workspaces or objects; particularly subclasses 804-805 for interwindow links and communication.
- 703, Data Processing: Structural Design, Modeling, Simulation, and Emulation, subclasses 23 through 28 for emulation of computer system components.
- 705, Data Processing: Financial Business Practice, Management, or Cost/Price Determination, various subclasses for applications of computers and calculators in business and management environments.
- 707, Data Processing: Database and File Management or Data Structures, subclass 103 for object oriented schema types.
- 709, Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring or Plural Processor Synchronization, subclasses 200 through 253 for multicomputer data transferring, per se.
- 710, Electrical Computers and Digital Data Processing Systems: Input/Output, subclasses 360 through 269 for interrupt processing, per se.
- 712, Electrical Computers and Digital Processing Systems: Processing Archi-

tectures and Instruction Processing (e.g., Processors), subclasses 220 through 248 for computer control including branch instruction computer.

- 717, Data Processing: Software Development Installation and Management, subclass 100 through 167 for software development tools, per se.

**329 Data transfer between application windows:**

This subclass is indented under subclass 328. Subject matter comprising means or steps for effecting communication or data transfer between application programs or processes executing within a graphical windowing environment.

SEE OR SEARCH CLASS:

- 345, Computer Graphics Processing, Interface Processing, and Selective Display Systems, subclass 804 and 805 for interwindow links and communication.

**330 REMOTE PROCEDURE CALL (RPC):**

This subclass is indented under the class definition. Subject matter comprising means or steps for invoking a target procedure in a remote address space.

- (1) Note. A remote procedure call is distinguished from local subroutine calls because the target procedure of a RPC is invoked in a remote address space, therefore, pointers or references to local data are invalid within the address space of the remote machine. Addressing, per se, branch instruction processing and compilers, per se, are classified elsewhere.
- (2) Note. For clarification, remote procedure calls are used in a distributed programming environment, communication with a remote environment is simplified in that programmers of distributed applications need not concern themselves with implementation details of communication with another address space, as support for the remote procedure call is provided by a kernel of each machine, distributed data processing, per se, and software development tools, however, are classified elsewhere.

- (3) Note. The subject matter of this subclass is directed to remote procedure calls (RPC), although RPCs look a lot like local procedure calls to the programmer, there are slight differences in the calling semantics. In addition, branching is a related topic. A concept search on RPC, branching or local procedure calling should consider these related topics.

SEE OR SEARCH CLASS:

- 709, Electrical Computers and Digital Processing Systems: Multicomputer Data Transferring or Plural Processor Synchronization, subclasses 201 through 203 for a distributed data computer.
- 712, Electrical Computers and Digital Processing Systems: Processing Architectures and Instruction Processing (e.g., Processors), subclasses 220 through 248 for computer control including branch instruction handling.
- 717, Data Processing: Software Development Installation and Management, subclass 100 through 167 for software development tools, per se.

**331 DYNAMIC LINKING, LATE BINDING:**

This subclass is indented under the class definition. Subject matter wherein functions contained within one or more executable code libraries (e.g., a dynamic link library or DLL) are called as needed at runtime by one or more application programs.

- (1) Note. For clarification, dynamic linking is distinguished from static linking in that very large programs can be executed in a limited memory space by loading and invoking external executable libraries only when needed at run time. The main executable program is much smaller than would result if the libraries and object files had been statically linked prior to runtime. In addition, multiple applications may reference a single dynamic link library (DLL). This eliminates redundant code and results in a more modular system. Also, existing programs can be readily updated without recompilation by providing updated DLLs.

- (2) Note. In implicit dynamic linking, links between calls in the application and functions in the DLL are resolved at link time. In explicit dynamic linking, links between calls in the application and functions in the DLL are resolved at run time.

SEE OR SEARCH CLASS:

- 717, Data Processing: Software Development, Installation, and Management, subclasses 162 through 167 for generic linking.

**332 Object oriented dynamic linking, late binding:**

This subclass is indented under subclass 331. Subject matter wherein dynamic linking or binding occurs in the context of an object oriented environment.

FOREIGN ART COLLECTIONS

The definitions below correspond to abolished subclasses from which these collections were formed. See the Foreign Art Collection schedule of this class for specific correspondences. [Note: The titles and definitions for indented art collections include all the details of the one(s) that are hierarchically superior.]

**FOR 168 INTERPROGRAM COMMUNICATION, INTERPROCESS COMMUNICATION:**

Foreign art collection including subject matter comprising means or steps for exchanging data or messages between two executing programs or processes, independent of the hardware used in the communication.

**FOR 169 Device driver communication:**

Foreign art collection including subject matter comprising means or steps for communication between application programs or operating systems and callable interfacing programs (i.e., device driver programs) which further facilitate communication or control of peripheral hardware devices such as printers, disk drives, tape drives, CRT displays, etc.

**FOR 170 Application program interfacing (API):**

Foreign art collection including subject matter comprising a set of routines, procedures, or interfaces which facilitate requests or calls from one or more application programs to lower-level operating system routines.

**FOR 171 Object-oriented messaging:**

Foreign art collection including subject matter comprising means or steps for communication between objects (e.g., a message tells a receiving object what to do) wherein a method or member function of a receiving object is invoked or called by a sending method of a sending object and the message passing may involve passing actual parameters (i.e., for example, either by reference or by value) to the target object.

**FOR 172 Remote procedure calling (RPC):**

Foreign art collection including subject matter comprising means or steps for invoking a target procedure in a remote address space.

**FOR 173 Dynamic linking, late binding:**

Foreign art collection including subject matter wherein functions contained within one or more executable code libraries (e.g., a dynamic link library or DLL) are called as needed at runtime by one or more application programs.

END